DOCUMENT RESUME

ED 424 249 TM 029 121

AUTHOR Hammann, Lynne A.; Stevens, Robert J.
TITLE Metacognitive Awareness Assessment in Self-Regulated Learning and Performance Measures in an Introductory Educational Psychology Course.
PUB DATE 1998-04-00
NOTE 8p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Diego, CA, April 13-17, 1998).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *College Students; Educational Assessment; Higher Education; Learning Strategies; *Metacognition; *Student Motivation
IDENTIFIERS *Self Regulated Learning

ABSTRACT

This study investigated Self-Regulated Learning of 90 college students in an introductory educational psychology course at a large eastern university. Relationships among metacognition, motivational orientation, strategy use, and performance were examined. The study expanded on findings about The Metacognitive Awareness Inventory (MAI) (G. Schraw and R. Dennison, 1994) by using it in an instructional setting. It also examined relationships with The Motivational Strategies for Learning Questionnaire (MSLQ) (P. Pintrich, D. Smith, T. Garcia, and W. McKeachie, 1991) and with performance measures. Students' knowledge of cognition from the MAI was correlated with predictions of test performance, test scores, and on-line measure of accuracy of responses. Knowledge of cognition was also correlated with the MSLQ scales, Control of Learning Beliefs and Self-Efficacy for Learning and Performance. Regulation of cognition from the MAI was related to Intrinsic Goals Orientation, Task Value, and learning strategies on the MSLQ. This study adds to understanding the relationships of metacognition, motivation, and strategy use in an ecologically valid context. (Contains 3 tables and 11 references.) (Author/SLD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

TM

Metacognitive Awareness Assessment in Self-Regulated Learning and Performance Measures in an Introductory Educational Psychology Course

Lynne A. Hammann & Robert J. Stevens
The Pennsylvania State University

Lynne Hammann

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED 424 249

AERA, April 13-18, 1998

Abstract

This study investigated Self-Regulated Learning of college students in an introductory educational psychology course. Relationships among metacognition, motivational orientation, strategy use, and performance were examined. The study expanded on findings about The Metacognitive Awareness Inventory (Schraw & Dennison, 1994) by using it in an instructional setting. It also examined relationships with The Motivational Strategies for Learning Questionnaire (Pintrich, Smith, Garcia, & McKeachie, 1991), and with performance measures. Students' Knowledge of Cognition (MAI) was correlated with predictions of test performance, test scores, and on-line measure of accuracy of responses. Knowledge of Cognition was also correlated with MSLQ scales, Control of Learning Beliefs and Self-Efficacy for Learning and Performance. Regulation of Cognition (MAI) was related to Intrinsic Goal Orientation, Task Value, and learning strategies (MSLQ). This study adds to understanding the relationships of metacognition, motivation, and strategy use in an ecologically valid context.

Purposes

Self-regulation in learning is a complex activity integrating metacognition, motivation, and learning behaviors (Pintrich & DeGroot, 1990). Metacognition is the knowledge and control of one's cognitive system; its two components include knowledge of cognition and regulation of cognition. Metacognitive awareness implies that individuals can describe their own understanding and use information they have (Brown, 1987). They can also share this information with others (Jacobs & Paris, 1987). From a strategy-use perspective, knowledge of cognition includes an awareness of declarative, procedural, and conditional knowledges (Schraw & Dennison, 1994). Regulation of cognition includes planning, monitoring, and evaluative processes (Brown, 1987).

Metacognition is an important factor in the learning of individuals, but assessment of both knowledge and regulation of cognition processes is difficult. These processes are recursive and often difficult to separate (Brown, 1987). Questions about metacognitive awareness in individuals' learning processes pose challenges for researchers and educators.

This study had two objectives: (a) to expand on the previous research of the Metacognitive Awareness Inventory (Schraw & Dennison, 1994) by investigating its usefulness in the context of course learning, and (b) to investigate the relationship between metacognitive awareness and motivational factors in the more ecologically valid context of an academic course.

Theoretical Framework

The ability to plan and evaluate one's own learning is usually considered an intelligent behavior and related to planning, monitoring, and evaluating (Bransford, 1979). Research has shown that metacognitively aware learners are more effective learners (e.g., Swanson, 1990). They show higher performance levels, more use of strategies, and regulate their own learning better (Jacobs & Paris, 1987). Research studies have indicated a relationship between metacognitive processes and academic performance (e.g., Pintrich & DeGroot, 1990).

TM029121

Motivation is necessary for students to exert effort in any kind of academic task; as such, some kind of motivation is necessary for students to metacognitively regulate their behavior. In particular, students' goal orientation affects how they engage in the task and their metacognitive activity during the task (cf. Garner & Alexander, 1989). For example, students who are task-involved may ask themselves what they can try next if they encounter difficulty, whereas ego-involved students may simply question their own ability.

Similarly, a student's self-efficacy, another important motivational facet of academic behavior, influences how students approach and engage in learning tasks. In particular, self-efficacy may influence the choice and use of learning strategies that will in turn influence performance (Pintrich & DeGroot, 1990).

The interrelationships of motivation, metacognition, and strategic behavior are important, yet not well understood. While there has been success teaching students to be more metacognitively aware of their behavior (Jacobs & Paris, 1987) and to engage in better strategic behavior in learning tasks (cf. McKeachie, Pintrich, & Lin, 1985), students seldom transfer these behaviors to real-world contexts (Salomon & Globerson, 1987). Is there a lack of motivation to do so? Is there a lack of recognition of the need to do so? The goal of this study is to begin looking at these questions.

Methods

Subjects were 90 volunteers from an introductory educational psychology course at a large eastern university. Metacognitive awareness was measured by the Metacognitive Awareness Inventory (MAI, Schraw & Dennison, 1994). Motivation and strategy use were measured by the Motivated Strategies for Learning Questionnaire (MSLQ, Pintrich, Smith, Garcia, & McKeachie, 1991). Both the MAI and the MSLQ have likert-type scales, the MAI from 1-5, and the MSLQ from 1-7, with low numbers being Never True or Least Like Me, respectively.

Academic performance measures included a 20-item multiple choice test from questions (selected randomly) from the course test bank on material covered in class. On-line Confidence ratings followed each item on the 20-item test. These On-line Confidence ratings were on a 0-100mm bipolar scale. Subjects drew a line on the scale, from 0% Confidence on the left to 100% Confidence on the right, that indicated their confidence that the previous item was correct. The second performance measure was of Pretest Judgments, made before the subjects took the Test. These pretest judgments assessed how well subjects believed they could monitor the accuracy of their performance on these kinds of multiple choice tests. Subjects drew a mark on a bipolar 100mm scale labeled 0-100, with Poor Monitoring Ability (0) at the left end and Excellent Monitoring Ability (100) at the right.

An iterative principle axis factor analysis forcing two factors with orthogonal (varimax) loadings was performed on the item responses for the Metacognitive Awareness Inventory. This factor analysis yielded loadings corresponding theoretically with Knowledge of Cognition (10 items, 7.654% of the variance) and Regulation of Cognition (26 items, 15.865% of the variance). Factor loadings also supported Schraw & Dennison's (1994) item loadings. These loadings were used to compute subjects' Knowledge of Cognition and Regulation of Cognition scores for the rest of the analyses. Test scores on the 20-item Test were computed as percentages, each item being 5%. The Pretest Judgment scores were taken by measuring the student's mark on the 100mm scale. Confidence ratings were measured for each item, and the average was taken for On-line Confidence for the complete test, expressed as a percentage. The Motivated Strategy for Learning Questionnaire was scored as directed in the manual.

Results and Conclusions

The first objective of the study was to expand upon the previous research of the MAI by investigating it in the context of learning behaviors and test performance in the context of a college course. The MAI's measure of Knowledge of Cognition was positively correlated with Pretest Judgement (.507) and On-line Confidence ratings (.333) of the test (Performance Measures).

Pretest Judgment was positively correlated with both the test (.298) and On-Line Confidence (.443). Students seemed to be aware of how they would do on tests in this course and be able to monitor their answers to test items.

The second objective was investigating the relationship between metacognition and motivation factors in course performance. Metacognition processes and motivational ones appear to be correlated on subcomponent levels related to performance measures. Knowledge of Cognition was correlated positively with Self-Efficacy for Learning and Performance (.502, Motivation Expectancy Component, MSLQ) and negatively with Test Anxiety (-.408, Motivation Affective Component, MSLQ). Self-Efficacy was correlated with the Test (.367), Pretest Judgment (.386), and On-Line Confidence (.437). Test Anxiety was negatively correlated with Pretest Judgment (-.440) and On-Line Confidence (-.321).

Regulation of Cognition (MAI) was correlated with the individual Learning Strategies Scales of the MSLQ, all four of the Cognitive and Metacognitive Strategies and two of the four Resource Management Strategies. These results provide further validation for this measure as suggested by Schraw & Dennison (1994). Metacognitive Self-Regulation (Learning Strategies, MSLQ) was correlated with both Knowledge of Cognition (.393) and Regulation of Cognition (.721) of the MAI.

This study shows that knowledge of cognition and regulation of cognition as measured by the MAI are related to students' performance on classroom performance measures. Similarly, these constructs are related to students' report of the strategies they use in studying the content on that test and the types of motivations they have toward learning the content. This provides evidence that students' metacognitive awareness is related to their task motivation and their subsequent use of strategies in preparing for classroom assessment. It seems that students need to be metacognitively aware of the need to use strategies, knowledgeable about strategies, and motivated to use those strategies. Without such awareness, strategy instruction seems futile.

The MAI offers a measurement tool for determining students' level of metacognitive awareness. Potentially students who are identified as exhibiting less metacognitive awareness could be instructed and given practice in activities to develop their knowledge and regulation of their cognitive activity (cf. Borkowski, 1992). This may remove an impediment in the challenging task of developing more strategic learners.

References

Borkowski, J.G. (1992). Metacognitive theory: A framework for teaching literacy, writing, and math skills. Journal of Learning Disabilities, 25, 4, 253-257.

Bransford, J.D. (1979). Human cognition: Learning, understanding, and remembering. Belmont, CA: Wadsworth Publishing Company.

Brown, A. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In F.E. Weinert & R.H. Kluwe (Eds.), Metacognition, motivation, and understanding (pp. 65-116). Hillsdale, NJ: Lawrence Erlbaum, Publishers.

Garner, R., & Alexander, P.A. (1989). Metacognition: Answered and unanswered questions. Educational Psychologist, 24, 143-158.

Jacobs, J.E., & Paris, S.G. (1987). Children's metacognition about reading: Issues in definition, measurement, and instruction. Educational Psychologist, 22 (3 & 4), 255-278.

McKeachie, W.J., Pintrich, P.R., & Lin, Y.-G. (1985). Teaching learning strategies. Educational Psychologist, 20, 3, 153-160.

Pintrich, P.R., & DeGroot, E.V. (1990). Motivational and self-regulated components of classroom academic performance. Journal of Educational Psychology, 82, 1, 33-40.

Pintrich, P.R., Smith, D.A.F., Garcia, T., & McKeachie, W. (1991). A manual for the use of the motivated strategies for learning questionnaire. Ann Arbor, MI: University of Michigan, NCRIPTL.

Schraw, G., & Dennison, R.S. (1994). Assessing metacognitive awareness. Contemporary Educational Psychology, 19, 460-475.

Salomon, G., & Globerson, T. (1987). Skill is not enough: The role of mindfulness in learning and transfer. International Journal of Research in Education, 11, 623-638.

Swanson, H.L. (1990). Influence of metacognitive knowledge and aptitude on problem solving. Journal of Educational Psychology, 82, 2, 306-314.

Lynne A. Hammann
4730 Vincent Lane
Ft. Drum, NY 13603
315-773-5237
lah192@psu.edu

Dr. Robert J. Stevens
The Pennsylvania State University
202 CEDAR Building
University Park, PA 16802
814-863-2417
rjs15@psu.edu

Descriptive Statistics of MAI factors and Performance Measures

	Mean	Stdev	Range
Know of Cognition	36.156	4.564	21-46
Regul of Cognition	90.744	12.859	60-125
Pretest	53.47 2	22.883	6-97
Test Items	77.611	13.159	40-100
Confidence	70.711	13.437	36-94

Table 1
Zero-order correlations for MAI measures and Performance measures

	1	2	3	4	5
Knowledge of Cognition	1.000	.282*	.507*	.248*	.333*
Regulation of Cognition		1.000	.003	.001	.159
Pretest Judgement			1.000	.298*	.443*
Test Items				1.000	.517*
Confidence					1.000

*p<.05)

Table 2
Zero Order Correlations for Metacognitive Awareness Inventory Factors and Motivated Strategies for Learning Questionnaire Scales

	MAI FACTORS	
	Knowledge of Cognition	Regulation of Cognition
MSLQ		
MOTIVATION SCALES		
Value Component		
Intrinsic Goal Orientation	.192	.405*
Extrinsic Goal Orientation	.018	.023
Task Value	-.001	.326*
Expectancy Component		
Control of Learning Beliefs	.258*	.155
Self-Efficacy for Learning & Performance	.502*	.101
Affective Component.		
Test Anxiety	-.408*	.192
LEARNING STRATEGIES SCALES		
Cognitive & Metacog Strat		
Rehearsal	-.122	.255*
Elaboration	.140	.575*
Organization	.018	.630*
Critical Thinking	.103	.454*
Metacognitive Self-Regulation	.393*	.721*
Resource Management Strat		
Time & Study Environ	.182	.325*
Effort Regulation	.176	.228*
Peer Learning	.076	.167
Help Seeking	.154	.161

*($p<.05$)

Table 3
Statistically significant zero-order correlations between performance measures, the MAI, and the MSLQ

	PERFORMANCE MEASURES		
	Pretest	Test Items	Confidence
MAI			
Knowledge of Cognition	.507	.248	.333
Regulation of Cognition			
MSLQ			
Motivation			
Control of Learning Beliefs	.280		
Self-Efficacy for Learning			
& Performance	.386	.367	.437
Test Anxiety	-.440	-.280	-.321
Learning Strategies			
Rehearsal	-.359		
Cognitive & Metacognitive Self-Regulation			.211
Time & Study Environment			.217
Effort		.373	.274